

Monitoring Colorado's Birds: The Plan for Count-based Monitoring

Prepared by

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Introduction

Population monitoring is the backbone of avian conservation. Without current monitoring data, conservation efforts are likely to be misguided and inefficient. Monitoring is required under federal and state legislative and resource management agency mandates as well as a host of long-range plans, Forest plans, ecoregional plans, preserve management plans, *etc.* (Sauer 1993, Manley et al. 1993, Colorado Division of Wildlife 1994). From a global biodiversity perspective, Colorado hosts many species of birds at or near their greatest regional abundances (Appendix A) and therefore has a high, long-term responsibility for conserving these species (*sensu* Rosenberg and Wells 2000).

The effective conservation and management of Colorado's birds depends on adequate monitoring information, which to a large extent, does not exist. To date, resource managers have relied on data derived from the Breeding Bird Survey (BBS), currently the best and most extensive bird-monitoring program, to monitor bird populations (Robbins et al. 1989, Sauer 1993). The BBS uses volunteers to conduct roadside surveys of birds across North America and produces indices of population abundance at the continental scale for many common bird species (see Robbins et al. 1986). Unfortunately, the design and implementation of the BBS is such that results generated from these efforts are often inconclusive due to the difficulty associated with interpreting index counts (Sauer 2000), as well as numerous confounding variables (Robbins et al. 1986, Bohning-Gaese et al. 1993, Sauer et al. 1994, James et al. 1996, Thomas 1996, Rosenstock et al. in prep.). In addition, many species and habitats are inadequately sampled by the BBS (Robbins et al. 1993, Sauer 1993) and BBS data do not reliably predict population trends at low geographic scales (Sauer 2000). Finally, BBS data have limited use for determining responses of bird communities to environmental change and/or management action, and in identifying causes of population change (Sauer and Cooper 2000), in part because habitat data are not recorded during BBS counts. For these reasons, BBS data are generally insufficient to guide local or regional management decisions.

Several authors have suggested the implementation of regional habitat-based bird monitoring programs to complement data generated by BBS (Butcher 1992, Butcher et al. 1993, Sauer 2000, Sauer and Cooper 2000). In cooperation with the agencies charged with protecting and managing Colorado's birds, Rocky Mountain Bird Observatory (RMBO) has proposed and implemented a bird monitoring program for the state in which **every** agency/organization has the opportunity to contribute and benefit (Table 1). This plan depends on each agency assuming responsibility for the dominant habitats on the lands they manage. This program is currently supported by Colorado Division of Wildlife, U.S.D.A. Forest Service, Bureau of Land Management, and National Park Service. This project is entitled *Monitoring Colorado's Birds (MCB)*.

Monitoring Colorado's Birds is designed to provide population trend or status data on all regularly-occurring breeding species in the state. A total of 280 species of birds has bred in Colorado, 256 annually. The first phase of *MCB* is to ensure that count-based data are obtained for all species which can be monitored effectively through a habitat-based approach, and that species-specific tracking or census programs are employed for those species requiring more specialized techniques. The second phase should include demographic studies to determine the possible reasons for known declines and for the purposes of developing management information. Herein we develop a plan for Phase I, the count-based monitoring of all of Colorado's regularly- breeding bird species. This plan was developed using information drawn from BBS data, Colorado Breeding Bird Atlas data, and Partner's In Flight (PIF) priority scores (Appendix A).

MCB was first drafted as a state-based plan that draws funding only from agencies within Colorado, and focuses solely on habitats within the state. However, a biologically-based plan would provide more meaningful and complete monitoring data on bird populations. Therefore, it is our goal to expand this program in the near future to the level of Bird Conservation Region (BCR). BCRs are more ecologically-meaningful management units for birds because they encompass distinct ecoregions in North America that host similar bird communities (NABCI Committee 2000). Colorado is primarily comprised of two distinctly contrasting BCRs: the Shortgrass Prairie (BCR#18) and the Southern Rockies/Colorado Plateau (BCR#16), each of which extend into neighboring states. A BCR-level plan would require that all states occupying significant portions of BCRs contribute proportionately to fund monitoring efforts in those BCRs. Such a plan would be more cost-effective because it would eliminate duplicate efforts by states to obtain independent data sets from habitats they share with other states, while still providing meaningful data on bird populations that could be used at the state level. Partners In Flight has adopted the BCR as the focus unit for ranking conservation priorities among bird species, and the North American Bird Conservation Initiative (NABCI) has stressed the need for regionally-based approaches to bird conservation involving cooperative partnerships within BCRs (NABCI Committee 2000).

Background

Although analyses of BBS data have indicated population declines in some bird species (Robbins et al. 1986), we do not believe that there are wholesale declines in birds as reported by some media, individuals, initiatives, or environmental groups. However, population trend data for many western bird species are lacking (see Appendix A).

Using criteria established by Carter et al. (2000), currently at least 78% of Colorado's regularly breeding species in BCR 16, and 76% of its' regularly breeding species in BCR 18 are not adequately monitored by the BBS (Appendix A). Of the species that are well monitored by the BBS in these BCRs, there are some species whose populations are declining, some that are increasing, and some that are stable (Appendix A). Consider, however, that if proportions of increasing, decreasing, and stable species are roughly the same in the list of unmonitored species as they are in the list of monitored species, then it is likely that a considerable number of population declines remain undetected. Furthermore, because declines are harder to detect than increases (variance increases as populations decline), the proportion of declining species in the unmonitored list is probably even higher.

Statistical Targets and Assumptions

Monitoring should be efficient, low-level, and permanent, and we have designed this program with these points in mind. To do monitoring correctly, one needs a target -- a threshold of time span and population change that balances statistical rigor with cost-effectiveness. It is desirable to detect a fairly small population change (particularly, a negative one) in a fairly short amount of time. However, the sample sizes required would probably be prohibitively costly. Therefore, as our target we selected a minimum rate of population change of -3.0% per year and

a maximum time period of 30 years in which to detect population changes (see Butcher 1992, Robbins et al. 1993 for similar trend detection targets). We used the formula:

$$\text{cumulative change} = ([(\text{annual change}/100)+1]^{n-1}-1)(100)$$

to calculate total population loss over a 30-year period with an annual decline of 3.0%. This equates to a 58.7% loss of a population in 30 years, which is probably not large enough to trigger listing under the Endangered Species Act. It is, however, advance warning enough to trigger action.

Along with this target are assumptions. What levels of statistical rigor (i.e. power and significance) would we like to reach? We selected a statistical probability of $p=0.10$ (Askins et al. 1990, Butcher 1992) to indicate a significant population change. A statistical probability of $p=0.10$ gives moderate protection against Type I error (finding trends that are false). We gave *MCB* only such moderate protection, because it is often more useful and practical for wildlife managers to determine the direction and magnitude of a trend than establish its significance at a very high level (i.e. traditionally, $p=0.05$). Similarly, we set power at 0.8 (Butcher 1992, Downes et al. 2000), which gives moderate protection against Type II error (failing to find trends that are real). Considering cost and the need to have a sufficient number of well-dispersed sampling units, we initially designed this program with 30 samples (i.e. transects) per habitat. Using pilot data from 1998, we tested this number of samples and confirmed that 30 would be sufficient to meet our target and assumptions.

With these assumptions, we used the computer program MONITOR (Patuxent Wildlife Research Center 2000) to model the efficiency of 30 pilot transects run in each of three habitats in 1998 (Leukering and Carter 1999). Specifically, we used MONITOR to determine the threshold for the coefficient of variation (CV; Standard Deviation/Mean) associated with point-transect data that will generate useful monitoring information. A CV reflects the overall variability of data scaled against the mean; that is, species with large abundances but high variability have CVs similar to those of species with low abundance and low variability. CVs are a function of factors inherent to a species (its abundance and variability in nature) and statistical considerations such as sample size and method of sampling. MONITOR indicates that for species with associated CVs of less than 1.00, we will be able to detect 3.0%/year declines within 30 years of monitoring, with a statistical significance of $p=0.1$ and power of 0.8. For species with CVs of less than 0.50, MONITOR indicates that we will be able to detect declines of 3.0%/year within 12 years.

Methods

MCB employs a variety of survey techniques (e.g., point transects, line transects, and colony counts) to obtain trend and status data on Colorado's birds. Each technique is thoroughly described by Leukering and Levad (2000) and summarized in Appendix B. An underlying tenet of *MCB* is to allocate more effort to those species for which Colorado is an important breeding area, and relatively little effort to species that are peripheral to the area. While most species can be monitored through use of a single technique, the ecologies of some species are such that those species are not adequately surveyed through randomized sampling efforts. Therefore, not all species will be monitored by the same technique, nor will every species be monitored. Game

species and federally-listed Threatened or Endangered (T&E) species will not receive specific attention under *MCB*, as monitoring programs already exist for these species under other mandates. We believe monitoring efforts under *MCB* should focus on those species currently not monitored under any program. However, data generated by *MCB* on these species will be available and could be used to supplement other management information for these species.

Although we use the term “monitoring” loosely throughout most of this plan, in the strictest sense, “monitoring” is possible only for those species for which we can obtain a sufficient number of samples (i.e., those species with $CVs < 1.00$) to meet high levels of statistical rigor when testing for population change. For some species that occur in low relative abundance across the landscape, “monitoring” will not be possible without greatly increasing the amount of funds and effort devoted toward those species. Instead, we intend to “track” populations of low-abundance or localized species, with the implication being that any trends detected for these species will have low statistical power.

For transect-based data, bird species with associated CVs of less than 1.00 (most will be under 0.50) will be “monitored”, whereas those with CVs greater than 1.00 will be “tracked”. For data obtained through species-specific techniques, “monitoring” will be possible for those species for which we are able to locate and survey all known breeding locations in a given year (e.g. Eared Grebe, Great Blue Heron, and Franklin’s Gull). For rare or local species whose breeding locations are not known with complete certainty, we will “track” populations using counts at known breeding locations (e.g. Green Heron, Scott’s Oriole, Bell’s Vireo).

MCB relies primarily on transect-based techniques, through which we expect to monitor approximately 42% of Colorado’s breeding bird species and track an additional 23% (Table 2). Through the use of species-specific techniques, we expect to monitor 6% and track an additional 14% of Colorado’s breeding birds (Table 2). The remaining 15% of species are T&E or Game species not covered under *MCB*.

Standard distance-sampling techniques (Buckland et al. 1993) are used during all transect surveys, and density estimates of bird species are derived using program DISTANCE (Thomas et al. 1998). We have become painfully aware of the many problems associated with sampling bird populations and believe that distance-sampling techniques may be useful in sorting out problems of detectability that could result from a myriad factors, most importantly changes to the habitat over the term of this program. We do not intend to use these techniques to develop densities as an end product, but rather as a tool to derive an index that is not confounded by detectability issues. In the event that distance-sampling techniques do not prove to be useful, we will analyze our data using more traditional techniques (e.g., via fixed radii).

All transects (except nocturnal transects) are located at randomly selected sites and are not biased toward or against roads, as starting points and transect bearing are determined randomly. All technicians are highly-skilled field ornithologists and each goes through a training session at the beginning of the season to ensure that the field protocol is fully understood and that distance-estimation skills are reasonably similar (within 10% of true value) among crew members.

Products

Annual summaries of results and periodic trend analyses will be provided to all participating agencies via paper reports, publications, and the World Wide Web.

To date, *MCB* has been funded primarily by the Great Outdoors Colorado Trust Fund through Colorado Division of Wildlife. Other partners have provided substantial cash and in-kind contributions. We estimate that count-based data for each habitat will cost approximately \$10,338/year (Table 3). This figure includes only the costs to obtain transect-based data from each habitat and does not specifically allocate funds for species-specific monitoring techniques. However, when multiple habitats are included in the budget, the synergistic effects of per-habitat funding (i.e., overlap in data management, analysis, report writing, etc.) should provide sufficient funds to cover the cost of most species-specific monitoring techniques. In Colorado, the program has been funded to address 16 habitats, which provides sufficient funds to address most species with the appropriate technique.

Literature Cited

- Askins, R.A., J.F. Lynch, and R. Greenburg. 1990. Population declines in migratory birds in eastern North America. *Current Ornithology* 7:1-57.
- Bohning-Gaese, K., M.L. Taper, and J.H. Brown. 1993. Are declines in insectivorous songbirds due to causes on the breeding range? *Conservation Biology* 7:76-86.
- Buckland, S.T., D.R. Anderson, K.P. Burnham, and J.L. Laake. 1993. *Distance Sampling: Estimating Abundance of Biological Populations*. Chapman and Hall, London, reprinted 1999 by RUWPA, University of St. Andrews, Scotland. 446pp.
- Butcher, G.S. (ed.). 1992. Needs Assessment: Monitoring Neotropical Migratory Birds. Partners In Flight, Ithaca, NY. 58 pp.
- Butcher, G.S., B. Peterjohn, and C.J. Ralph. 1993. Overview of national bird population monitoring programs and databases. In Finch, D.M. and P.W. Stangel (eds.), Status and Management of Neotropical Migratory Birds; 1992 Sept. 21-25; Estes Park, CO. Gen. Tech. Rep. RM-229. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 422 pp.
- Carter, M.F., W.C. Hunter, D.N. Pashley, and K.V. Rosenberg. 2000. Setting conservation priorities for landbirds in the United States: The Partners In Flight approach. *Auk* 117:541-548.
- Colorado Division of Wildlife. 1994. Long Range Plan (Revised Draft). Colorado Department of Natural Resources, Division of Wildlife, Denver. 33 pp.
- Downes, C.M., E.H. Dunn, and C.M. Francis. 2000. Canadian Landbird Monitoring Strategy: Monitoring needs and priorities into the new millennium. Partners In Flight-Canada, Ottawa. 64 pp.
- James, F.C., C.E. McCullough, and D.A. Weidenfeld. 1996. New approaches to the analysis of population trends in landbirds. *Ecology* 77:13-27.
- Leukering, T. and M.F. Carter. 1999. Colorado Birds Monitored by 2001: Results of point-transects in three Colorado habitats with an appendix of results of special species monitoring. Colorado Bird Observatory, unpublished report. 34 pp.
- Leukering, T. and R. Levad. 2000. Monitoring Colorado's Birds: Protocols. Colorado Bird Observatory unpublished document. 16 pp.

- Manley, P.N., W.M. Block, F.R. Thompson, G.S. Butcher, C. Paige, L.H. Suring, D.S. Winn, D. Roth, C.J. Ralph, E. Morris, C.H. Flather, and K. Byford. 1993. Guidelines for Monitoring Populations of Neotropical Migratory Birds on National Forest System Lands. USDA Forest Service, Washington. 35 pp.
- NABCI Committee. 2000. North American Bird Conservation Initiative in the United States: A vision of American bird conservation. USFWS, Div. of North American Waterfowl and Wetlands, Arlington, VA.
- Patuxent Wildlife Research Center. 2000. Program MONITOR. <http://www.mp1-pwrc.usgs.gov/powcase/Manual.htm> version 11.2000.
- Robbins, C.S., D. Bystrak, and P.H. Geissler. 1986. The Breeding Bird Survey: It's first fifteen years, 1965-1979. U.S. Fish and Wildlife Resource Publication 157. 196 pp.
- Robbins, C.S., J.R. Sauer, R.S. Greenburg, and S. Droege. 1989. Population declines in North American birds that migrate to the neotropics. *Proc. Natl. Acad. Sci., USA* 86:7658-7662.
- Robbins, C.S., J.R. Sauer, and B.G. Peterjohn. 1993. Population trends and management opportunities for Neotropical migrants. In Finch, D.M. and P.W. Stangel (eds.) *Status and Management of Neotropical Migratory Birds*; 1992 Sept. 21-25; Estes Park, CO. Gen. Tech. Rep. RM-229. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 422 pp.
- Rosenberg, K.V. and J.V. Wells. 2000. Global perspectives on Neotropical migratory bird conservation in the Northeast: Long-term responsibility versus immediate concern. In R. Bonney et al. (eds.), *Strategies for Bird Conservation: The Partners in Flight Planning Process. Proceedings of the 3rd Partners In Flight Workshop*; 1995 Oct. 1-5, Cape May, NJ. USDA Forest Service, Rocky Mountain Research Station, 281 pp.
- Rosenstock, S.S., D.R. Anderson, K.M. Geisen, T. Leukering, and M.F. Carter. In prep. Estimating landbird abundance: current practices and an alternative.
- Sauer, J.R. 1993. Monitoring Goals and Programs of the U.S. Fish and Wildlife Service. In Finch, D.M. and P.W. Stangel (eds.) *Status and Management of Neotropical Migratory Birds*; 1992 Sept. 21-25; Estes Park, CO. Gen. Tech. Rep. RM-229. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 422 pp.
- Sauer, J.R., B.G. Peterjohn, and W.A. Link. 1994. Observer differences in the North American Breeding Bird Survey. *Auk* 111:50-62.
- Sauer, J.R. 2000. Combining information from monitoring programs: complications associated with indices and geographic scale. In R. Bonney et al. (eds.), *Strategies for Bird Conservation: The Partners in Flight Planning Process. Proceedings of the 3rd Partners In Flight Workshop*; 1995 Oct. 1-5, Cape May, NJ. USDA Forest Service, Rocky Mountain Research Station. 281 pp.
- Sauer, J.R. and R. Cooper. 2000. Population and habitat assessment: Monitoring bird populations over large areas. In R. Bonney et al. (eds.), *Strategies for Bird Conservation: The Partners in Flight Planning Process. Proceedings of the 3rd Partners in Flight Workshop*; 1995 Oct. 1-5, Cape May, NJ. USDA Forest Service, Rocky Mountain Research Station. 281 pp.
- Stahlecker, D.W. 1997. Using tape playback of the staccato song to document Boreal Owl (*Aegolius funereus*) reproduction. In Duncan, J.R., D.H. Johnson, and T.H. Nicholls (eds.), *Biology and Conservation of Owls of the Northern Hemisphere: 2d International Symposium*; 1997 February 5-9; Winnipeg, MB. Gen. Tech. Rep. NC-190. St. Paul MN: U.S.D.A. Forest Service, North Central Research Station. 635 p.

- Thomas, L. 1996. Monitoring long-term population change: why are there so many analysis methods? *Ecology* 77:49-58.
- Thomas, L., J.L. Laake, J.F. Derry, S.T. Buckland, D.L. Borchers, D.R. Anderson, K.P. Burnham, S. Strindberg, S.L. Hedley, M.L. Burt, F.F.C. Marques, J.H. Pollard, and R.M. Fewster. 1998. *Distance 3.5*. Research Unit for Wildlife Population Assessment, University of St. Andrews, UK.

Table 1. Designations by habitat of responsible agencies with numbers of species expected to be monitored or tracked in each habitat¹.

Habitat	Agency ²	# species monitored ³	# species tracked ³
Uniform-block habitats ⁴			
Pinyon-Juniper	Bureau of Land Management	11	4
Sage Shrubland	Bureau of Land Management	4	0
Semidesert Shrubland	Bureau of Land Management	2	4
Grassland	CO Division of Wildlife	6	8
Lodgepole Pine	CO Division of Wildlife	0	1
Montane Shrubland	CO Division of Wildlife	8	3
Ponderosa Pine	CO Division of Wildlife	6	1
Alpine Tundra	National Park Service	1	1
Spruce-Fir	U.S. Forest Service	9	5
Aspen	U.S. Forest Service	9	2
Mixed Conifer	U.S. Forest Service	8	2
Non-uniform-block habitats ⁵			
High-elevation Riparian	CO Division of Wildlife	6	5
Low-elevation Riparian	CO Division of Wildlife	22	27
Wetlands	CO Division of Wildlife	15	12
Dispersed, non-uniform, and/or anthropogenic habitats ⁶			
Cliff/Rock	CO Division of Wildlife	5	9
Rural/Agriculture	CO Division of Wildlife	6	10
Shore/Bank	CO Division of Wildlife	5	1
TOTAL		123	95

¹ Species are allocated to the habitat in which they achieve maximum density in Colorado. However, most species occur across a range of habitats. Therefore, for each habitat, we will obtain monitoring data on numerous species other than those specifically allocated to that habitat.

² Though some agencies are associated herein with certain habitats that host few species, all agencies will benefit from *Monitoring Colorado's Birds* due to the availability of monitoring data to all.

³ See **Methods** for distinction between "monitored" vs. "tracked".

⁴ Uniform-block habitats are those that we believe will be well sampled with random allocation of point transects.

⁵ Non-uniform-block habitats are those that will require extra effort or somewhat different counting techniques due to the widespread, but localized or narrow aspects of those habitats.

⁶ These habitats are not vegetation-based, are found across large elevational gradients, and host species specific to the habitat, but not necessarily the associated vegetation type. We do not anticipate allocating transects to these habitats; funding for these will be dispersed among other habitats, devoted to species-specific techniques, and/or used to interpret BBS data.

Table 2. Number and percent of regularly-breeding bird species that *MCB* will monitor and track per survey method.

Method	# species monitored (%)	# species tracked (%)	Total	Percent of total (n=256)
Transect-based techniques				
Point transect	77	37	114	44.5
Line transect	26	17	43	16.8
Nocturnal transect	4	6	10	3.9
Total, transect-based techniques	107 (42%)	60 (23%)	167 (65%)	65.2
Species-specific techniques				
Statewide survey	1	16	17	6.6
Colony count	15	3	18	7.0
Expert survey	0	16	16	6.3
Total, special techniques	16 (6%)	35 (14%)	51 (20%)	19.9
Not monitored under <i>MCB</i>				
Threatened & Endangered	0	5	5	2.0
Game species	0	33	33	12.9
Total, political designations	0	38	38	14.9
TOTAL	123	133	256	100.0

Table 3. Proposed budget to perform monitoring in one habitat under *MCB*.

Item	Cost
Personnel	
45 days ¹ (2.25 mos.) of technician time (\$1700/mo.)	\$3,825
Organization/analysis/report (senior staff for 3 wks @ \$2,800/mo.)	\$2,100
Taxes and benefits (12.46%)	\$738
Personnel subtotal	\$6,663
Logistics	
Mileage (3,300 mi x 0.28/mi.)	\$924
Lodging (18 nights @ \$40/night)	\$720
Field food (45 days x \$15/day)	\$675
Logistics subtotal	\$2,319
Indirect/overhead (15.10%)	\$1,356
TOTAL (per habitat)	\$10,338

¹ Field personnel conduct 1 transect/day in the morning, scout the next day's transect in the afternoon, and whenever possible, conduct species-specific surveys in the afternoon. Staff time includes pre-season training and post-season data entry.

Appendix A. Designated habitat, Partner's In Flight priority scores for BCRs 16 & 18, suggested methods for and expected results of monitoring for each of Colorado's breeding bird species. Scores provided are: AI=area importance¹, PT=population trend², PTDQ=population trend data quality³ (Carter et al. 2000). %POP is an index of a species' population contained within that BCR (Rosenberg and Wells 2000).

Species	Habitat	BCR 16				BCR 18				Technique	Result
		AI	PT	PTDQ	%POP	AI	PT	PTDQ	%POP		
Pied-billed Grebe	Wetlands	2	3	D3	1.13	2	3	E	0.29	Colony count	Tracked
Eared Grebe	Wetlands	3	3	D4	3.19	2	3	D4	0.32	Colony count	Monitored
Western Grebe	Wetlands	2	3	F	0.00	3	3	F	0.00	Colony count	Monitored
Clark's Grebe	Wetlands	2	3	F	0.00	3	3	F	0.00	Colony count	Monitored
American White Pelican	Shore/Bank	3	3	D4	0.59	3	3	D1	3.35	Colony count	Monitored
Double-crested Cormorant	Low-elevation Riparian	2	3	D4	0.21	2	3	D1	0.63	Colony count	Monitored
American Bittern	Wetlands	2	3	D4	0.40	2	3	F	0.09	Line transect	Tracked
Least Bittern	Wetlands	1	3	F	0.00	2	3	F	0.00	Expert survey	Tracked
Great Blue Heron	Low-elevation Riparian	3	3	D3	1.12	2	1	B1	1.08	Colony count	Monitored
Great Egret	Low-elevation Riparian	1	3	F	0.00	1	3	F	0.02	Colony count	Monitored
Snowy Egret	Wetlands	2	3	F	0.33	2	3	F	0.24	Colony count	Monitored
Little Blue Heron	Low-elevation Riparian	1	3	F	0.00					Expert survey	Tracked
Cattle Egret	Wetlands	2	3	F	0.00	1	3	D4	0.09	Colony count	Monitored
Green Heron	Low-elevation Riparian	2	3	F	0.00	2	3	F	0.07	Expert survey	Tracked
Black-crowned Night-Heron	Low-elevation Riparian	2	3	D1	1.39	3	2	C1	8.23	Colony count	Monitored
Yellow-crowned Night-Heron	Low-elevation Riparian					1	3	F	0.00	Expert survey	Tracked
White-faced Ibis	Wetlands	4	3	F	0.87	2	3	F	0.66	Colony count	Monitored
Turkey Vulture	Cliff/Rock	3	2	C2	1.65	2	1	A1	1.94	Point transect	Tracked
Canada Goose	Wetlands	3	2	C3	1.46	2	2	C1	0.17	N/A	Tracked
Wood Duck	Low-elevation Riparian	2	3	F	0.00	2	3	F	0.26	N/A	Tracked
Gadwall	Wetlands	3	3	D3	2.95	2	3	D4	0.19	N/A	Tracked
American Wigeon	Wetlands	2	3	D3	0.39	2	3	F	0.12	N/A	Tracked
Mallard	Wetlands	2	2	C2	1.38	3	2	A2	1.98	N/A	Tracked
Blue-winged Teal	Wetlands	2	3	D4	0.13	2	2	B2	1.28	N/A	Tracked
Cinnamon Teal	Wetlands	3	3	D3	5.77	2	2	C1	1.49	N/A	Tracked
Northern Shoveler	Wetlands	2	3	D1	0.33	2	3	D4	0.78	N/A	Tracked
Northern Pintail	Wetlands	2	3	D4	0.44	2	5	B1	0.47	N/A	Tracked
Green-winged Teal	Wetlands	3	4	C3	1.73	2	3	D4	0.92	N/A	Tracked

Species	Habitat	BCR 16				BCR 18				Technique	Result
		AI	PT	PTDQ	%POP	AI	PT	PTDQ	%POP		
Canvasback	Wetlands	2	3	F	0.11	2	3	F	0.00	N/A	Tracked
Redhead	Wetlands	2	3	D1	1.50	2	3	E	0.59	N/A	Tracked
Ring-necked Duck	Wetlands	4	3	D1	4.32					N/A	Tracked
Lesser Scaup	Wetlands	2	3	D1	0.88	1	3	F	0.00	N/A	Tracked
Harlequin Duck	High-elevation Riparian	1								N/A	Tracked
Bufflehead	High-elevation Riparian	2	3	F	0.01					N/A	Tracked
Barrow's Goldeneye	High-elevation Riparian	2	3	F	0.00					N/A	Tracked
Hooded Merganser	Low-elevation Riparian	1	3	F	0.00	1	3	F	0.00	N/A	Tracked
Common Merganser	High-elevation Riparian	4	3	D1	3.53	1	3	F	0.02	N/A	Tracked
Ruddy Duck	Wetlands	2	3	D1	2.28	2	3	F	0.12	N/A	Tracked
Osprey	High-elevation Riparian	2	3	F	0.25	1	3	F	0.02	State-wide survey	Tracked
Mississippi Kite	Low-elevation Riparian	2	3	F	0.00	3	3	E	3.96	State-wide survey	Tracked
Bald Eagle	Low-elevation Riparian	2	3	F	0.08	2	3	F	0.00	N/A	Tracked
Northern Harrier	Wetlands	3	3	D4	1.52	4	4	C2	4.37	Point transect	Tracked
Sharp-shinned Hawk	Spruce-Fir	5	3	D4	5.73	2	3	F	0.18	Point transect	Tracked
Cooper's Hawk	Aspen	4	2	C3	5.48	2	3	F	0.56	Point transect	Tracked
Northern Goshawk	Mixed Conifer	5	3	D3	3.96					Point transect	Tracked
Broad-winged Hawk	Low-elevation Riparian					1				Expert survey	Tracked
Swainson's Hawk	Grassland	2	3	D4	2.24	5	2	A2	20.94	Point transect	Tracked
Red-tailed Hawk	Low-elevation Riparian	3	1	A1	2.78	3	1	A1	1.90	Point transect	Tracked
Ferruginous Hawk	Grassland	2	3	D3	2.19	5	3	D2	21.11	Point transect	Tracked
Golden Eagle	Cliff/Rock	5	4	C2	13.57	4	3	D3	2.94	Point transect	Tracked
American Kestrel	Low-elevation Riparian	4	4	C6	4.47	5	2	A2	4.23	Point transect	Tracked
Peregrine Falcon	Cliff/Rock	4	3	D4	5.83					Point transect	Tracked
Prairie Falcon	Cliff/Rock	4	3	D3	11.60	5	1	B1	10.17	Point transect	Tracked
Chukar	Semidesert Shrubland	2	3	E	3.12					N/A	Tracked
Ring-necked Pheasant	Rural/Agricultural	2	4	C3	0.72	5	4	C4	10.02	N/A	Tracked
Ruffed Grouse	Aspen									N/A	Tracked
Gunnison Sage-Grouse	Sage Shrubland	5	5	9	100.00					N/A	Tracked
Greater Sage-Grouse	Sage Shrubland	2	3	F	1.19					N/A	Tracked
Blue Grouse	Mixed Conifer	3	3	D3	3.73					N/A	Tracked

Species	Habitat	BCR 16				BCR 18				Technique	Result
		AI	PT	PTDQ	%POP	AI	PT	PTDQ	%POP		
White-tailed Ptarmigan	Alpine Tundra	4	3	F	0.00					N/A	Tracked
Greater Prairie-Chicken	Grassland					3	3	D4	7.58	N/A	Tracked
Lesser Prairie-Chicken	Grassland					5	3	F	0.00	N/A	Tracked
Sharp-tailed Grouse	Montane Shrubland	2	3	F	0.00	2	3	D3	0.58	N/A	Tracked
Wild Turkey	Ponderosa Pine	2	3	D1	1.01	2	3	D3	1.76	N/A	Tracked
Scaled Quail	Grassland	2	3	D4	1.02	3	5	A1	8.37	N/A	Tracked
Gambel's Quail	Low-elevation Riparian	2	3	D1	1.45					N/A	Tracked
Northern Bobwhite	Low-elevation Riparian	1	3	F	0.00	3	3	D2	2.55	N/A	Tracked
Black Rail	Wetlands					2				Expert survey	Tracked
Virginia Rail	Wetlands	3	3	F	1.96	2	3	F	0.00	Line transect	Tracked
Sora	Wetlands	2	3	D1	0.18	2	3	F	0.00	Expert survey	Tracked
American Coot	Wetlands	2	3	D3	2.36	2	3	E	0.82	N/A	Tracked
Sandhill Crane	Wetlands	2	3	D3	0.35					State-wide survey	Tracked
Snowy Plover	Shore/Bank	3	3	F	0.00	3	4	9	0.00	N/A	Tracked
Piping Plover	Shore/Bank					2	3	F	0.00	N/A	Tracked
Killdeer	Shore/Bank	3	5	A1	1.74	4	2	A2	4.79	Line transect	Monitored
Mountain Plover	Grassland	4	3	F	4.99	5	3	D4	73.60	Point transect	Tracked
Black-necked Stilt	Wetlands	1	3	F	0.03	2	3	D4	0.83	State-wide survey	Tracked
American Avocet	Wetlands	2	3	D1	0.82	3	3	D3	4.93	Line transect	Tracked
Willet	Wetlands	2	3	F	0.00	1	3	F	0.03	State-wide survey	Monitored
Spotted Sandpiper	Low-elevation Riparian	3	4	C2	1.63	2	3	D4	0.07	Line transect	Monitored
Upland Sandpiper	Grassland					2	4	C3	1.37	Expert survey	Tracked
Long-billed Curlew	Grassland	2	3	D3	0.78	5	4	C2	14.08	Point transect	Tracked
Marbled Godwit	Grassland					1				Expert survey	Tracked
Common Snipe	Wetlands	3	1	A1	1.46	2	3	D3	0.09	Line transect	Tracked
Wilson's Phalarope	Wetlands	3	3	D3	3.14	2	3	D4	0.74	Line transect	Tracked
Franklin's Gull	Wetlands	1								Colony count	Monitored
California Gull	Shore/Bank	4	3	D1	10.77	2	3	D4	0.70	Colony count	Monitored
Forster's Tern	Wetlands	2				2	3	F	0.75	Colony count	Monitored
Least Tern	Shore/Bank					2	4	9	0.17	N/A	Tracked
Black Tern	Wetlands	2				2	3	F	0.08	Colony count	Monitored

Species	Habitat	BCR 16				BCR 18				Technique	Result
		AI	PT	PTDQ	%POP	AI	PT	PTDQ	%POP		
Rock Dove	Rural/Agricultural	2	2	C3	0.88	3	2	C2	3.64	Point transect	Tracked
Band-tailed Pigeon	Ponderosa Pine	3	3	D3	2.89					N/A	Tracked
Eurasian Collared-Dove	Rural/Agricultural					2				State-wide survey	Tracked
Mourning Dove	Rural/Agricultural	3	4	C4	1.96	5	2	A2	7.82	Point transect	Monitored
Inca Dove	Rural/Agricultural	1	3	F	0.00	1	3	F	0.00	Expert survey	Tracked
Black-billed Cuckoo	Low-elevation Riparian					2	3	F	0.00	State-wide survey	Tracked
Yellow-billed Cuckoo	Low-elevation Riparian	2	3	F	0.00	2	2	B2	0.24	State-wide survey	Tracked
Greater Roadrunner	Semidesert Shrubland	1	3	D1	0.58	2	2	C3	2.05	Point transect	Tracked
Barn Owl	Rural/Agricultural	2	3	F	0.00	4	3	F	9.32	Nocturnal transect	Tracked
Flammulated Owl	Ponderosa Pine	4	3	F	0.00					Nocturnal transect	Monitored
Eastern Screech-Owl	Low-elevation Riparian					2	3	F	0.00	Expert survey	Tracked
Western Screech-Owl	Low-elevation Riparian	3	3	F	7.08	2	3	F	0.00	Nocturnal transect	Tracked
Great Horned Owl	Low-elevation Riparian	3	3	D3	1.45	4	3	D2	4.31	Nocturnal transect	Tracked
Northern Pygmy-Owl	Mixed Conifer	2	3	F	6.54					Expert survey	Monitored
Burrowing Owl	Grassland	2	3	D3	2.28	5	3	D2	34.95	Colony count	Tracked
Spotted Owl	Ponderosa Pine	2	3	F	0.00					N/A	Tracked
Long-eared Owl	Low-elevation Riparian	3	3	F	0.00	2	3	F	0.00	Nocturnal transect	Monitored
Short-eared Owl	Wetlands	2	3	F	0.01	2	3	F	0.16	Nocturnal transect	Tracked
Boreal Owl	Spruce-Fir	3	3	F	0.00					Nocturnal transect	Tracked
Northern Saw-whet Owl	Pinyon-Juniper	3	3	F	0.00					Nocturnal transect	Tracked
Common Nighthawk	Grassland	3	5	A1	5.85	4	4	C4	7.41	Point transect	Monitored
Common Poorwill	Montane Shrubland	3	3	D3	8.32	2	3	D4	0.71	Nocturnal transect	Monitored
Black Swift	Cliff/Rock	3	3	F	0.55					Colony count	Tracked
Chimney Swift	Rural/Agricultural					2	3	D1	0.19	Line transect	Tracked
White-throated Swift	Cliff/Rock	5	3	D2	24.05	2	3	F	0.38	Point transect	Tracked
Magnificent Hummingbird	Ponderosa Pine	1	3	F	0.00					Expert survey	Tracked
Black-chinned Hummingbird	Pinyon-Juniper	3	2	C3	13.09	2	3	F	0.68	Point transect	Monitored
Broad-tailed Hummingbird	Aspen	5	4	C6	64.59					Point transect	Monitored
Belted Kingfisher	Shore/Bank	3	4	C3	1.34	2	4	C1	0.41	Line transect	Monitored
Lewis's Woodpecker	Low-elevation Riparian	5	3	D4	27.09	4	4	C1	5.96	Line transect	Tracked
Red-headed Woodpecker	Low-elevation Riparian	1	3	F	0.01	3	2	B2	2.16	Point transect	Tracked

Species	Habitat	BCR 16				BCR 18				Technique	Result
		AI	PT	PTDQ	%POP	AI	PT	PTDQ	%POP		
Acorn Woodpecker	Ponderosa Pine	2	3	D4	0.27					Expert survey	Tracked
Red-bellied Woodpecker	Low-elevation Riparian					2	3	F	0.01	Line transect	Tracked
Red-naped Sapsucker	Aspen	5	2	C2	2.39					Point transect	Monitored
Williamson's Sapsucker	Mixed Conifer	4	2	C3	19.13					Point transect	Monitored
Ladder-backed Woodpecker	Low-elevation Riparian	1	3	D4	0.68	2	3	D1	2.65	Point transect	Tracked
Downy Woodpecker	Low-elevation Riparian	2	1	B1	0.46	2	3	D1	0.11	Expert survey	Monitored
Hairy Woodpecker	Ponderosa Pine	3	2	A2	2.92	2	3	F	0.22	Point transect	Monitored
Three-toed Woodpecker	Spruce-Fir	2	3	D3	1.12					Expert survey	Tracked
Northern Flicker	Low-elevation Riparian	5	2	A2	4.84	2	2	C3	0.38	Line transect	Monitored
Olive-sided Flycatcher	Aspen	3	2	C2	3.27					Point transect	Monitored
Western Wood-Pewee	Aspen	4	4	C6	10.93	2	2	C3	0.72	Point transect	Monitored
Willow Flycatcher	High-elevation Riparian	3	5	B1	0.08	1	3	F	0.00	Point transect	Tracked
Least Flycatcher	Low-elevation Riparian					1	3	F	0.00	Expert survey	Tracked
Hammond's Flycatcher	Aspen	3	3	D4	2.85					Point transect	Monitored
Dusky Flycatcher	Montane Shrubland	4	3	D2	10.30					Point transect	Monitored
Gray Flycatcher	Pinyon-Juniper	4	2	A2	13.43					Point transect	Monitored
Cordilleran Flycatcher	High-elevation Riparian	4	3	D2	6.07					Point transect	Monitored
Black Phoebe	Low-elevation Riparian	2	3	D4	0.80	2	3	F	0.07	State-wide survey	Tracked
Eastern Phoebe	Low-elevation Riparian	2	3	F	0.00	2	3	F	0.01	State-wide survey	Tracked
Say's Phoebe	Cliff/Rock	5	4	C6	17.79	5	3	D2	10.44	Point transect	Tracked
Vermilion Flycatcher	Low-elevation Riparian					2	3	F	0.34	Line transect	Tracked
Ash-throated Flycatcher	Pinyon-Juniper	3	3	D2	6.65	2	1	B1	1.00	Point transect	Monitored
Great Crested Flycatcher	Low-elevation Riparian					2	3	F	0.04	State-wide survey	Tracked
Cassin's Kingbird	Pinyon-Juniper	3	2	A2	11.22	2	2	C3	4.42	Point transect	Tracked
Western Kingbird	Low-elevation Riparian	2	3	D2	2.37	5	2	C6	19.37	Line transect	Monitored
Eastern Kingbird	Low-elevation Riparian	2	3	D3	0.02	3	4	C6	1.49	Line transect	Monitored
Scissor-tailed Flycatcher	Grassland					2	2	C3	3.48	Expert survey	Tracked
Loggerhead Shrike	Semidesert Shrubland	2	5	A1	2.47	3	2	A2	7.82	Point transect	Monitored
Bell's Vireo	Low-elevation Riparian	2	3	F	0.00	2	3	F	0.02	State-wide survey	Tracked
Gray Vireo	Pinyon-Juniper	5	3	D3	50.35	2	3	F	0.00	Point transect	Tracked
Plumbeous Vireo	Pinyon-Juniper	4	2	A2	24.89					Point transect	Monitored

Species	Habitat	BCR 16				BCR 18				Technique	Result
		AI	PT	PTDQ	%POP	AI	PT	PTDQ	%POP		
Warbling Vireo	Aspen	5	2	A2	13.14	2	3	D1	0.10	Point transect	Monitored
Red-eyed Vireo	Low-elevation Riparian	1	3	F	0.00	1	3	D4	0.01	Expert survey	Tracked
Gray Jay	Spruce-Fir	3	4	C3	0.33					Point transect	Monitored
Steller's Jay	Mixed Conifer	3	2	A2	9.01					Point transect	Monitored
Blue Jay	Low-elevation Riparian	1	3	F	0.02	2	2	C3	0.22	Line transect	Monitored
Western Scrub-Jay	Montane Shrubland	3	3	D2	7.88	2	2	C1	0.69	Point transect	Monitored
Pinyon Jay	Pinyon-Juniper	5	5	A1	46.28	2	3	D4	1.40	Point transect	Monitored
Clark's Nutcracker	Spruce-Fir	5	1	A1	37.36					Point transect	Tracked
Black-billed Magpie	Rural/Agricultural	5	2	C6	9.74	3	5	A1	1.90	Point transect	Monitored
American Crow	Rural/Agricultural	2	2	C2	0.56	2	4	C2	0.29	Line transect	Tracked
Chihuahuan Raven	Grassland	2	3	D4	4.89	5	4	C6	24.42	Point transect	Tracked
Common Raven	Cliff/Rock	5	1	A1	5.63	2	3	D4	0.25	Point transect	Tracked
Horned Lark	Rural/Agricultural	3	5	A1	5.26	5	4	C4	21.49	Point transect	Monitored
Purple Martin	Aspen	2	3	D3	0.21	1	3	F	0.05	State-wide survey	Tracked
Tree Swallow	Aspen	3	2	A2	2.75	2	3	F	0.05	Point transect	Monitored
Violet-green Swallow	Aspen	5	4	C6	18.45	2	3	F	1.34	Point transect	Monitored
Northern Rough-winged Swallow	Shore/Bank	5	2	C2	5.03	3	2	B2	1.27	Line transect	Monitored
Bank Swallow	Shore/Bank	3	3	D4	0.73	2	3	D1	0.20	Line transect	Tracked
Cliff Swallow	Cliff/Rock	3	3	D2	3.13	4	2	A2	4.56	Line transect	Monitored
Barn Swallow	Cliff/Rock	3	2	A2	1.52	4	1	A1	2.77	Line transect	Monitored
Black-capped Chickadee	Low-elevation Riparian	3	3	D2	0.84	1	3	E	0.07	Line transect	Monitored
Mountain Chickadee	Spruce-Fir	3	2	A2	16.37					Point transect	Monitored
Juniper Titmouse	Pinyon-Juniper	4	5	A1	29.02	2	3	D4	1.18	Point transect	Monitored
Bushtit	Pinyon-Juniper	3	2	B2	4.80	2	3	F	0.35	Point transect	Monitored
Red-breasted Nuthatch	Spruce-Fir	3	5	A1	2.06	1	3	F	0.03	Point transect	Monitored
White-breasted Nuthatch	Mixed Conifer	3	2	A2	4.55	2	3	F	0.44	Point transect	Monitored
Pygmy Nuthatch	Ponderosa Pine	4	4	C3	7.25	2	3	D4	0.73	Point transect	Monitored
Brown Creeper	Mixed Conifer	3	2	C1	1.99					Point transect	Monitored
Rock Wren	Cliff/Rock	5	4	C2	21.70	3	2	B2	1.94	Point transect	Monitored
Canyon Wren	Cliff/Rock	4	3	D4	11.49	2	3	E	1.50	Point transect	Monitored
Carolina Wren	Low-elevation Riparian					1	3	F	0.00	Expert survey	Tracked

Species	Habitat	AI	PT	BCR 16		AI	PT	BCR 18		Technique	Result
				PTDQ	%POP			PTDQ	%POP		
Bewick's Wren	Pinyon-Juniper	3	1	A1	4.65	2	1	B1	1.45	Point transect	Monitored
House Wren	Low-elevation Riparian	4	4	C6	3.36	2	2	C3	0.47	Line transect	Monitored
Marsh Wren	Wetlands	2	3	D4	1.59	2	3	F	0.03	Line transect	Monitored
American Dipper	High-elevation Riparian	4	3	D3	17.82					Point transect	Tracked
Golden-crowned Kinglet	Spruce-Fir	3	3	D4	0.53					Point transect	Monitored
Ruby-crowned Kinglet	Spruce-Fir	4	3	D2	4.09					Point transect	Monitored
Blue-gray Gnatcatcher	Pinyon-Juniper	3	2	C2	6.38	2	3	F	0.05	Point transect	Monitored
Eastern Bluebird	Low-elevation Riparian	1	3	F	0.00	2	3	D4	0.02	Line transect	Tracked
Western Bluebird	Ponderosa Pine	3	3	D2	14.70	2	3	F	0.90	Point transect	Monitored
Mountain Bluebird	Aspen	5	3	D2	27.88	2	3	D3	0.97	Point transect	Monitored
Townsend's Solitaire	Cliff/Rock	4	3	D2	12.91					Point transect	Monitored
Veery	High-elevation Riparian	2	3	D4	0.17					Expert survey	Tracked
Swainson's Thrush	High-elevation Riparian	2	3	D4	0.12					Expert survey	Tracked
Hermit Thrush	Spruce-Fir	4	2	A2	3.11					Point transect	Monitored
American Robin	Low-elevation Riparian	4	2	A2	3.01	2	1	A1	0.41	Line transect	Monitored
Gray Catbird	Low-elevation Riparian	2	2	C3	0.15	2	3	D4	0.02	Line transect	Tracked
Northern Mockingbird	Pinyon-Juniper	2	4	C6	2.62	3	2	A2	3.55	Point transect	Monitored
Sage Thrasher	Sage Shrubland	3	3	D2	8.39	2	3	F	0.00	Point transect	Monitored
Brown Thrasher	Low-elevation Riparian					2	3	D3	0.78	Line transect	Tracked
Bendire's Thrasher	Semidesert Shrubland	5	5	B1	35.01	1	3	F	0.00	Expert survey	Tracked
Curve-billed Thrasher	Semidesert Shrubland	1	3	D3	0.24	2	3	D3	2.16	Point transect	Tracked
American Pipit	Alpine Tundra	3	3	F	0.00					Point transect	Monitored
Cedar Waxwing	Montane Shrubland	2	3	D4	0.09	1	3	F	0.01	Expert survey	Tracked
European Starling	Rural/Agricultural	2	2	A2	1.21	3	2	C2	1.50	Line transect	Tracked
Golden-winged Warbler	Montane Shrubland					1				Expert survey	Tracked
Orange-crowned Warbler	Montane Shrubland	3	1	A1	0.48					Point transect	Monitored
Virginia's Warbler	Montane Shrubland	4	4	C6	32.40	1	3	F	0.00	Point transect	Monitored
Lucy's Warbler	Low-elevation Riparian	1	3	F	0.08					Expert survey	Tracked
Yellow Warbler	Low-elevation Riparian	4	2	A2	2.29	2	4	9	0.13	Line transect	Monitored
Chestnut-sided Warbler	Montane Shrubland	1				1	3	F	0.00	Expert survey	Tracked
Yellow-rumped Warbler	Mixed Conifer	3	4	C4	2.03					Point transect	Monitored

Species	Habitat	AI	PT	BCR 16		%POP	AI	PT	BCR 18		%POP	Technique	Result
				PTDQ					PTDQ				
Black-throated Gray Warbler	Pinyon-Juniper	3	4	C2		7.82						Point transect	Monitored
Grace's Warbler	Ponderosa Pine	4	4	C3		7.97						Point transect	Monitored
Bay-breasted Warbler	Ponderosa Pine	1										Expert survey	Tracked
American Redstart	Low-elevation Riparian	1	3	F		0.00	2	3	F		0.02	Expert survey	Tracked
Ovenbird	Montane Shrubland						2					State-wide survey	Tracked
Northern Waterthrush	High-elevation Riparian	1										Expert survey	Tracked
MacGillivray's Warbler	High-elevation Riparian	4	3	D2		7.70						Point transect	Monitored
Common Yellowthroat	Wetlands	2	3	D4		0.15	2	1	B1		0.14	Line transect	Monitored
Hooded Warbler	Low-elevation Riparian	1	3	F		0.00						Expert survey	Tracked
Wilson's Warbler	High-elevation Riparian	4	5	A1		1.64						Point transect	Monitored
Yellow-breasted Chat	Low-elevation Riparian	2	3	D3		0.95	2	2	C1		0.20	Line transect	Monitored
Hepatic Tanager	Ponderosa Pine	2	3	D4		2.91	1	3	F		0.30	Expert survey	Tracked
Western Tanager	Mixed Conifer	3	2	A2		10.11	1	3	F		0.02	Point transect	Monitored
Green-tailed Towhee	Montane Shrubland	5	3	D2		46.50	1	3	D4		0.10	Point transect	Monitored
Spotted Towhee	Montane Shrubland	4	2	C2		13.90	2	2	C1		0.97	Point transect	Monitored
Canyon Towhee	Semidesert Shrubland	2	3	D4		2.90	2	3	D3		1.47	Point transect	Tracked
Cassin's Sparrow	Grassland	2	3	D3		2.39	5	4	C4		38.55	Point transect	Monitored
Rufous-crowned Sparrow	Cliff/Rock	1	3	F		0.14	2	3	E		1.27	State-wide survey	Tracked
Chipping Sparrow	Ponderosa Pine	4	4	C4		2.47	2	3	D1		0.10	Point transect	Monitored
Brewer's Sparrow	Sage Shrubland	4	4	C6		14.08	2	4	C3		1.09	Point transect	Monitored
Field Sparrow	Low-elevation Riparian						2	3	D3		0.14	Line transect	Tracked
Vesper Sparrow	Sage Shrubland	4	2	A2		6.83	2	2	C3		0.52	Point transect	Monitored
Lark Sparrow	Semidesert Shrubland	3	4	C2		7.26	5	4	C4		17.73	Point transect	Monitored
Black-throated Sparrow	Semidesert Shrubland	3	4	C6		4.67	2	3	E		0.19	Point transect	Tracked
Sage Sparrow	Sage Shrubland	5	3	D2		15.26						Point transect	Monitored
Lark Bunting	Grassland	2	3	D3		0.20	5	4	C4		36.44	Point transect	Monitored
Savannah Sparrow	Wetlands	2	3	D2		0.24	2	3	D4		0.02	Line transect	Monitored
Grasshopper Sparrow	Grassland	1	3	F		0.15	5	4	C6		19.65	Point transect	Monitored
Fox Sparrow	High-elevation Riparian	2	1	B1		0.53						Expert survey	Monitored
Song Sparrow	Low-elevation Riparian	2	3	D2		1.24	2	3	D1		0.02	Expert survey	Monitored
Lincoln's Sparrow	High-elevation Riparian	3	3	D2		1.58						Point transect	Monitored

Species	Habitat	BCR 16				BCR 18				Technique	Result
		AI	PT	PTDQ	%POP	AI	PT	PTDQ	%POP		
White-crowned Sparrow	High-elevation Riparian	3	5	A1	1.56					Point transect	Monitored
Dark-eyed Junco	Mixed Conifer	3	2	A2	1.43					Point transect	Monitored
McCown's Longspur	Grassland					5	3	D3	18.42	Point transect	Monitored
Chestnut-collared Longspur	Grassland					2	3	D1	2.66	Point transect	Tracked
Northern Cardinal	Low-elevation Riparian					1	3	D4	0.08	Expert survey	Tracked
Rose-breasted Grosbeak	Low-elevation Riparian					2	3	F	0.00	Expert survey	Tracked
Black-headed Grosbeak	Montane Shrubland	3	2	A2	7.71	2	2	C1	0.61	Point transect	Monitored
Blue Grosbeak	Low-elevation Riparian	2	3	D2	1.44	3	1	A1	4.31	Line transect	Monitored
Lazuli Bunting	Low-elevation Riparian	5	3	D2	12.14	2	3	D3	0.19	Line transect	Monitored
Indigo Bunting	Low-elevation Riparian	1	3	D4	0.01	2	3	D4	0.01	Line transect	Tracked
Dickcissel	Rural/Agricultural	1	3	F	0.00	2	2	C2	1.85	Point transect	Tracked
Bobolink	Rural/Agricultural	2	3	F	0.05	2	3	D4	0.10	State-wide survey	Tracked
Red-winged Blackbird	Wetlands	3	4	C6	1.42	3	2	C6	3.30	Line transect	Monitored
Eastern Meadowlark	Grassland	1	2	C3	0.73	2	3	D3	1.91	Expert survey	Tracked
Western Meadowlark	Grassland	3	2	A2	3.55	5	2	A2	18.44	Point transect	Monitored
Yellow-headed Blackbird	Wetlands	2	3	D4	2.14	2	4	C3	0.29	Line transect	Monitored
Brewer's Blackbird	Rural/Agricultural	3	2	A2	6.14	2	2	C3	0.70	Point transect	Monitored
Common Grackle	Low-elevation Riparian	2	2	B2	0.26	4	3	D2	5.92	Line transect	Monitored
Great-tailed Grackle	Rural/Agricultural	2	2	C1	0.46	2	1	B1	3.05	Line transect	Tracked
Brown-headed Cowbird	Rural/Agricultural	3	2	C2	1.63	2	2	A2	0.91	Point transect	Monitored
Orchard Oriole	Low-elevation Riparian					2	3	D2	1.47	Line transect	Monitored
Baltimore Oriole	Low-elevation Riparian					2				State-wide survey	Tracked
Bullock's Oriole	Low-elevation Riparian	3	2	A2	4.79	4	2	A2	12.00	Line transect	Monitored
Scott's Oriole	Pinyon-Juniper	2	3	D3	2.14					State-wide survey	Tracked
Brown-capped Rosy-Finch	Alpine Tundra	5	3	F	0.00					Point transect	Tracked
Pine Grosbeak	Spruce-Fir	4	4	C3	3.64					Point transect	Monitored
Cassin's Finch	Spruce-Fir	4	2	A2	14.37					Point transect	Monitored
House Finch	Rural/Agricultural	3	3	D2	3.17	2	2	C2	1.72	Point transect	Monitored
Red Crossbill	Lodgepole Pine	4	3	D2	5.69	2	3	D4	0.90	Point transect	Tracked
White-winged Crossbill	Spruce-Fir	1	3	F	0.00					Expert survey	Tracked
Pine Siskin	Spruce-Fir	5	5	A1	9.42	2	3	D4	0.11	Point transect	Monitored

Species	Habitat	AI	PT	BCR 16		AI	PT	BCR 18		Technique	Result
				PTDQ	%POP			PTDQ	%POP		
Lesser Goldfinch	Montane Shrubland	3	3	D2	7.19	2	1	B1	1.21	Point transect	Tracked
American Goldfinch	Low-elevation Riparian	2	3	D2	0.64	2	3	D3	0.29	Expert survey	Tracked
Evening Grosbeak	Mixed Conifer	3	3	D3	2.36					Point transect	Tracked
House Sparrow	Rural/Agricultural	2	2	A2	0.88	4	5	A1	5.58	Point transect	Tracked

¹AI identifies areas of high importance to a species and is used to reflect the responsibility of an area to that species' conservation. AI scores are judged relative to the maximum abundance of that species as determined by BBS data. Where BBS data are poor or non-existent, a second method is used in conjunction with local review by experts knowledgeable about the species. Expert opinion criteria follow BBS-derived criteria so that, for example, an expert-derived score of "5" is defined as 50-100% of BBS maximum abundance. AI values are assigned as follows:

AI Score	AI criteria using BBS	AI criteria using expert opinion
1	Accidental	Accidental; does not breed annually in the BCR
2	0 - 5.9%	Species breeds regularly in BCR, but is peripheral
3	6 - 24.9%	Species is present in low relative abundance
4	25 - 49.9%	Species is present in moderate to high relative abundance
5	50 - 100%	Species is present in highest relative abundance

²PT reflects population change as determined by analysis of BBS data; PTDQ reflects the certainty with which PT is assessed based on *n* (# of BBS routes analyzed) and *P* (statistical significance of trend). PTDQ scores of A or B indicate high reliability of data; scores of C, D, E, or F indicate poor reliability (Carter et al. 2000, PIF technical committee memo; D. Pashley, personal comm.).

PT score	BBS trend (%change/yr)	PTDQ	n	P
1=significant increase	>1.41	A1	≥34	#.10
		B2	14 to 33	#.10
2= possible increase	>1.41	C2	≥14	.11 to .35
		C1	6 to 13	#.10
2=stable	-2.36 to 1.41	A2	≥34	Any P
		B2	14 to 33	Any P
3=trend uncertain	<-2.36 or >1.41	D	≥14	>.35
		E1	6 to 13	>.10
	Any trend	E2	<6	Any P
		F	—	---
4=possible decrease	<-2.36	C2	≥14	.11 to .35
		C1	6 to 13	#.10
5=significant decrease	<-2.36	A1	≥34	#.10
		B1	14 to 33	#.10

Appendix B. Glossary of survey techniques.

Term	Definition
Transect-based efforts	
Line transect (Low-elevation Riparian)	Thirty 'float' transects (1 mile in length) using line-transect methodology (Buckland et al. 1993). Starting points are randomly located on navigable rivers (<5500' elev.) selected at random from available sites. Density estimates for bird species are derived using program DISTANCE (Thomas et al. 1998).
Line transect (Wetlands)	Thirty line transects (300 m in length) using line-transect methodology (Buckland et al. 1993). Start points are randomly located in wetland stands randomly selected from available sites. Density estimates for bird species are derived using program DISTANCE (Thomas et al. 1998).
Nocturnal transect	Forty-five road-based transects (19 miles in length; 1 mile between stops) in montane areas (i.e. BCR16) using point-transect methodology (Buckland et al. 1993). Start points were determined systematically by overlaying grid intersections and selecting the closest point on a road to each intersection, utilizing only secondary and tertiary roads that are accessible during the requisite seasons. Density estimates for bird species are derived using program DISTANCE (Thomas et al. 1998). Each transect was allocated to early, mid-, and/or late season (March/April, June, and September, respectively) in order to survey for different species. The fall transects were conducted solely to obtain data on Boreal and N.Saw-whet owls at a season in which roads are accessible in their high-elevation habitats (Stahlecker 1997). We attempted to do these transects in BCR 18, but the resultant data were too few for analysis.
Point transect	Thirty 15-point transects (250 m between points) in each of 12 habitats, following point-transect methodology (Buckland et al. 1993). Habitat stands were selected at random from available stands within a habitat type. Start points and transect bearings were determined randomly. Count duration at points is five minutes. Individual transects are the sampling units. Density estimates for bird species are derived using program DISTANCE (Thomas et al. 1998).
Species-specific efforts	
Colony count	A count of all nesting individuals at colony sites. For colonially-breeding herons, this can take the form of one of two methods, 1) actual counts of occupied nests or 2) counts of adults observed at the colony site, depending on the species and colony site access. Counts are seasonally timed to maximize the number of breeding adults and minimize the number of transient individuals.
Expert survey	We receive information from birders across the state as to locations and numbers of accidental and peripheral breeders. Little or no effort is expended by RMBO in obtaining this information.
State-wide survey	A state-wide estimate of all individuals of a target species, based on counts during prime breeding period at all known breeding localities
Unmonitored species	
N/A	This designation implies that these species are either game species or are federally Threatened/Endangered species for which specific legislatively mandated monitoring programs already exist. MCB does not specifically target effort at these species enabling us to avoid duplication of effort and focus on currently un-monitored species.